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NASA Events: [Expedition 27 Launch to International Space Station, 6:18 p.m. EDT, Monday, April 4](#)



84 Teams to Compete in NASA Great Moonbuggy Race April 1-2

Forty years after the first lunar rover rolled across the moon's surface, 84 teams of enterprising future engineers will demonstrate the same ingenuity and can-do spirit at the 18th annual NASA Great Moonbuggy Race.

[2011 Great Moonbuggy Race: Get the Latest](#)

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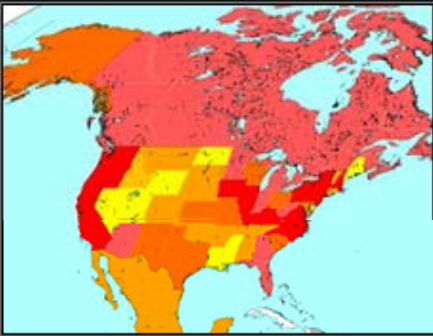
Women@NASA

Space Camp Alum Uses Hubble to Captivate Students

Sun-Earth Day 2011

[NASA's Spaceward Bound Goes to the Deserts of the UAE](#)

Observing Clouds for NASA Becomes a Class Tradition




For more than 10 years, seventh graders at Chartiers-Houston Jr./Sr. High School in Houston, Pa., have helped NASA scientists make sure satellites are identifying clouds correctly.

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Looking for Classroom Materials?

NASA's Education Materials Finder will help teachers locate resources that can be used in the classroom. Users may search by keywords, grade level, product type

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Selected Grade(s): Grades 5-8
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NASA - Meteorology: An Educator's Resource for Inquiry-Based Learning for Grades 5-9

The lesson plans and activities in this guide ask students to build and/or test a variety of weather instruments to better understand the basic factors involved in weather phenomena.

Resource Type: Classroom Activity, Lesson Plan, Educator Guide

Grade Level: 5-8, 9-12

Subjects Covered: Earth Science > Meteorology | General Science > Earth's Weather

Understanding the Climate System - Clouds

on and their characteristics in this module for 5-8.

Lesson Plan, Educator Guide

Earth Science > Environment | Earth Science > Geography | Earth Science > Oceanography | Earth Science > Space Science | Mathematics > Computation and Estimation | Mathematics > Algebra | Mathematics > Graphs | Mathematics > Physics |

Geology

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For Educators

▼ Grades K-4

Grades K-4

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NASA Educator Resource Center Network

Did you know there is a place where...

- NASA has educator guides on a variety of subjects for grades K-12.
- You can attend educational workshops on NASA related subjects.
- You can learn about NASA educational programs available for students and educators across the country.

Image to right: The purpose of a NASA Educator Resource Center (ERC) is to help teachers learn about and use NASA's educational resources. Credit: NASA

Most of these resources are free to educators, and NASA is there to assist with instructions on how to use them.

That's where the **NASA Educator Resource Center Network** comes in. The purpose of a NASA Educator Resource Center (ERC) is to help teachers learn about and use NASA's educational resources. Personnel at ERCs located throughout the United States work with teachers to find out what they need and to share NASA's expertise. The ERCs provide educators with demonstrations of educational technologies such as NASA educational Web sites and NASA Television. ERCs provide inservice and preservice training utilizing NASA instructional products.




Image to left: NASA's Aerospace Professional Development Center at Oklahoma State University (OSU) is part of NASA's Educator Resource Center Network. Credit: OSU

NASA Educational Resources are aligned with National Education Standards

Through the Educator Resource Center Network, NASA provides the expertise and necessary facilities to help educators access and utilize science, mathematics, technology, and geography instructional products. All of these products are aligned with national standards and appropriate state frameworks and are based on NASA's unique mission and results. ERCs also partner with local, state, and regional educational organizations to become part of the systemic education reform

initiatives in the state.




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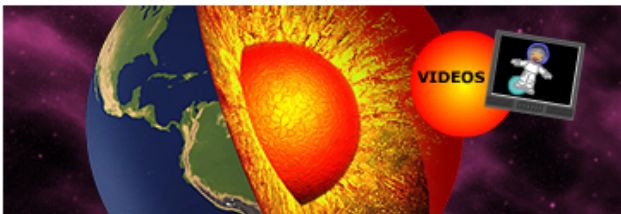
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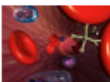

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 <p>Field Trip to the Moon: LRO/LCROSS DVD This DVD consists of a 21-minute Feature Presentation, information about the Lunar Reconnaissance Orbiter and the Lunar Crater Observation and Sensing Satellite missions, moon trivia questions and the downloadable Field Trip to the Moon: LRO/LCROSS Edition Informal Educator Guide. + Read More</p>	<p>NASA Educator's Web Site Visit NASA's Web site designed specifically for educators. + View site</p>
 <p>Space Faring: The Radiation Challenge DVD This DVD contains materials and resources for hands-on investigations into space radiation and the effects of radiation on living systems. + Read More</p>	<p>NASA Educational Materials NASA online publications are a perfect complement to CORE products. + View site</p>
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Create your own podcast with NASA video and audio clips.

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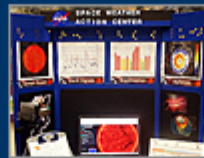
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Students can use these lists to find NASA information.

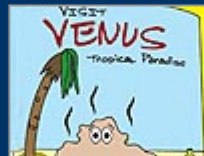
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Space Weather Action Center

Follow the steps on this site to begin accessing, analyzing and recording NASA data.



Planet X-treme Weather

Take a tour of weather on the other planets.



Reduced Gravity Education Flight Program

Do you want to conduct an experiment on a reduced-gravity flight? Applications from K-12 educators are due March 14, 2011.

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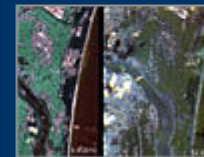


NASA Edge and Sun-Earth Day

Look back at Sun-Earth Day 2008 and learn about the Space Weather Action Center in this episode titled *Magnetospherence™*.

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Earthquake Webchat

The Education Office at NASA's Jet Propulsion

Laboratory in California is hosting a live video chat about earthquakes on March 18, 2011, at 1 p.m. EDT.



Earth Image of the Day

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NASA Educational Multimedia



NASA Education EXPRESS Mailing List

www.nasa.gov/education/express

The screenshot shows the NASA Education EXPRESS Mailing List sign-up page. The top navigation bar includes links for HOME, NEWS, MISSIONS, MULTIMEDIA, CONNECT, and ABOUT NASA. Below the navigation bar is a search bar and a "Log In To MyNASA" link. The left sidebar contains a "NASA Education" menu with options for "About NASA Education", "For Educators" (which is expanded to show links for Grades K-4, Grades 5-8, Grades 9-12, Higher Education, Informal Education, Find Teaching Materials, Education TV Schedule, and Current Opportunities), "For Students", and "NASA Kids' Club". The main content area is titled "EXPRESS E-mail Signup" and features a "Text Size" control, an "Average Rating: 3.6 / 5 (54 ratings)" with star icons, and a "Send" button. A large image of a person looking up at a NASA EXPRESS sign is displayed. Below the image, a text box explains the purpose of the mailing list and provides a link to "View NASA Privacy Notice". At the bottom, there is a yellow star icon, a text input field for the email address, and radio buttons for "subscribe" and "unsubscribe".

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EXPRESS E-mail Signup

Text Size + - Average Rating: 3.6 / 5 (54 ratings) ★★★★★ ?

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 everything to our children's
 future. We know that they will
 no longer just compete for
 good jobs with children from
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 India and China and all over
 the world.

leadership tomorrow
 depends on how we educate
 our students today --
 especially in science,
 technology, engineering and
 math

~President Barack Obama



Searching for Materials Using the Alabama Course of Study

6th

SIXTH GRADE Earth and Space Science

Students will: ...

7. Describe Earth's biomes.

Examples: aquatic biomes, grasslands, deserts, chaparrals, taigas, tundras

- Identifying geographic factors that cause diversity in flora and fauna, including elevation, location, and climate

8. Describe how Earth's rotation, Earth's axial tilt, and distance from the equator cause variations in the heating and cooling of various locations on Earth.

9. Identify the moon's phases.


- Describing lunar and solar eclipses
- Relating effects of the moon's positions on oceanic tides

10. Describe components of the universe and their relationships to each other, including stars, planets and their moons, solar systems, and galaxies.

- Identifying the impact of space exploration on innovations in technology
Examples: MRI, microwave, satellite imagery, GPS
- Mapping seasonal changes in locations of constellations in the night sky
- Describing the life cycle of a star
Example: H-R diagram

11. Describe units used to measure distance in space, including astronomical units and light years.

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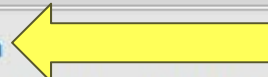
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1 2 3



[NASA - Distance to the Moon](#)



Students calculate the distance between scale models of Earth and the moon.

Resource Type: Classroom Activity, Lesson Plan

Grade Level: K-4, 5-8, 9-12

Subjects Covered: Mathematics > Computation and Estimation | Mathematics > Measurement | Space Science > Solar System and Planets > Moon | Technology > Models | General Science > Earth's Moon

[NASA - Space Math II](#)


This second collection of mathematics and reading activities explores the sun-Earth system.

Resource Type: Classroom Activity, Lesson Plan, Educator Guide

Grade Level: 5-8, 9-12

Subjects Covered: Mathematics > Computation and Estimation | Mathematics | Mathematics > Geometry | Mathematics > Algebra | Mathematics > Trigonometry | Mathematics > Graphs | Physical Science > Heat and Light | Space Science > Solar System and Planets > Sun |

Activity and Educator Guide



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Classroom Activity

Text Size + -

Average Rating: 2.3 / 5 (4 ratings) ★★☆☆☆ ?

Distance to the Moon


Audience: Educators

Grades: 4-12

In this activity, students calculate the distance between scale models of Earth and the moon.

[Distance to the Moon Activity](#) [117KB PDF file]

This activity is part of the [Exploring the Moon Educator Guide](#).



Teacher Page

Distance to the Moon

Purpose

To calculate the distance between scale models of Earth and the Moon.

Background

As long as people have looked at the Moon, they have wondered how far away it is from Earth. The average distance to the Moon is 384,400 km. The distance varies because the Moon travels around Earth in an elliptical orbit. At perigee, the point at which the Moon is closest to Earth, the distance is approximately 363,300 km. At apogee, the point at which the Moon is farthest from Earth, the distance is approximately 405,500 km.

Distance from Earth to the Moon for a given date can be obtained by asking a local planetarium staff. Students interested in astronomy may enjoy looking at the astronomical distance granted yearly by the U.S. Government printing office. When the Apollo 11 crew landed on the Moon on July 20, 1969, they were 383,100 km away from home.

In this activity students will use simple objects to make **scale** models of Earth and the Moon. Given the astronomical distance between Earth and the Moon, students will determine the scale of the model system and the distance that best represents the relationship.

The "Moon ABC's Fact Sheet" lists the Earth's diameter as 12,756 km and the Moon's diameter as 3,476 km. Therefore, the Moon's diameter is 27.27% of Earth's diameter. An official basketball has a diameter of 24 cm. This can serve as a model for Earth. A tennis ball has a diameter of 6.9 cm which is close to 27.27% of the basketball's. (The tennis ball is actually 26.8% the size of the basketball.) These values are very close to the size relationship between Earth and the Moon. The tennis ball, therefore, can be used as a model of the Moon.

The scale of the model system is determined by setting the diameter of the basketball equal to the diameter of Earth. This is written as a simple relationship shown below:

$$24 \text{ cm} = 12,756 \text{ km}$$

Expressed more simply, 1 cm in the model system equals 531.5 km in space:

$$1 \text{ cm} = 531.5 \text{ km}$$

Modeling the Moon • © 1999 by NASA with permission, NASA ID: 49581 (U.S. model)

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National Aeronautics and Space Administration

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Exploring the Moon Educator Guide

Audience: Educators

Grades: 4-12

Product Number: EG-1997-10-116-HQ

The activities in this guide promote problem solving, communication skills and teamwork. Earth and space science subjects include lunar geology and regolith, distance to the moon, Apollo landing sites and life support systems.

[Exploring the Moon Educator Guide](#) [7MB PDF file]

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[Moon ABCs Fact Sheet](#)

[Rock ABCs Fact Sheet](#)

[Progress in Lunar Science](#)

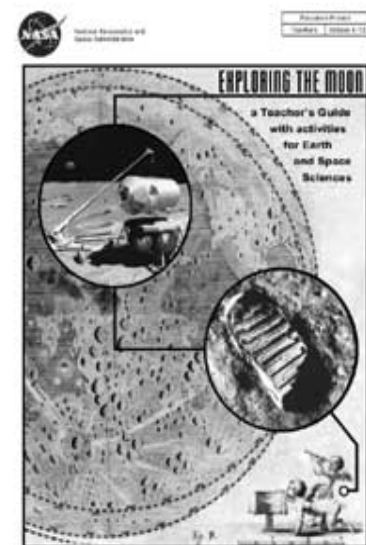
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[Reaping Rocks](#)



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Using the Standards with “Distance to the Moon”

• NASA Educator Guides are aligned to the national standards in science, mathematics, technology, geography, and language arts standards.

• The Alabama Course of Study is closely aligned with the national standards.

National Science Standards with “Distance to the Moon”

Unifying Concepts and Processes

Science as Inquiry

Physical Sciences

-Motion and Forces

Earth and Space Science

-Structure of the Earth System

- Earth in the Solar System

National Math Standards with “Distance to the Moon”

Numbers and Operations

Measurement

Alabama Course of Study Standards with “Distance to the Moon”

6th Grade Science Standards

10. Describe components of the universe and their relationships to each other, including stars, planets and their moons, solar systems, and galaxies.

11. Describe units used to measure distance in space, including astronomical units and light years.

6th Grade Math Standards

Numbers and Operations

- Comparing rational numbers written as fractions, decimals, mixed numbers, and percents
- Solve problems involving decimals, percents, fractions, and proportions

Measurement

- Convert units of length, weight, or capacity within the same system (customary or metric)

6th Grade Social Studies Standards

Identify critical events...the Cold War...space race

Identify Alabama's role in the Cold War

- Rocket production at Redstone Arsenal

Distance to the Moon Activity

Teacher Page



Teacher Page

Distance to the Moon

Purpose

To calculate the distance between scale models of Earth and the Moon.

Background

As long as people have looked at the Moon, they have wondered how far away it is from Earth. The average distance to the Moon is 382,500 km. The distance varies because the Moon travels around Earth in an elliptical orbit. At perigee, the point at which the Moon is closest to Earth, the distance is approximately 360,000 km. At apogee, the point at which the Moon is farthest from Earth, the distance is approximately 405,000 km.

Distance from Earth to the Moon for a given date can be obtained by asking a local planetarium staff. Students interested in astronomy may enjoy looking at *The Astronomical Almanac* printed yearly by the U.S. Government printing office. When the Apollo 11 crew landed on the Moon on July 20, 1969, they were 393,309 km away from home.

In this activity students will use simple sports balls as scale models of Earth and the Moon. Given the astronomical distance between Earth and the Moon, students will determine the scale of the model system and the distance that must separate the two models.

The "Moon ABCs Fact Sheet" lists the Earth's diameter as 12,756 km and the Moon's diameter as 3,476 km. Therefore, the Moon's diameter is 27.25% of Earth's diameter. An official basketball has a diameter of 24 cm. This can serve as a model for Earth. A tennis ball has a diameter of 6.9 cm which is close to 27.25% of the basketball. (The tennis ball is actually 28.8% the size of the basketball.) These values are very close to the size relationship between Earth and the Moon. The tennis ball, therefore, can be used as a model of the Moon.

The scale of the model system is determined by setting the diameter of the basketball equal to the diameter of Earth. This is written as a simple relationship shown below:

$$24 \text{ cm} = 12,756 \text{ km}$$

Expressed more simply, 1 cm in the model system equals 531.5 km in space:

$$1 \text{ cm} = 531.5 \text{ km}$$

Exploring the Moon – A Teacher's Guide with Activities, NASA EG-1997-10-116-HQ

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Distance to the Moon

Using this scale, the basketball-tennis ball separation in centimeters (x) is derived:

$$x = \frac{382,500 \text{ km}}{531.5 \text{ km}} = 719.7 \text{ cm}$$

The value x may be rounded to 720 cm and converted to meters so that the students need to place the basketball and tennis ball 7.2 m apart.

Preparation

Review and prepare materials listed on the student sheet.

If it is not possible to obtain an official-size basketball and tennis ball, then you can use other spherical objects or circles drawn on paper. Clay balls may be used as models. For example, for two clay balls, 10 cm diameter and 2.7 cm diameter, the scale is 1 cm = 1,275.6 km. At this scale, students need to separate the clay balls by 3 m.

In Class

Divide the students into cooperative groups. Students must keep track of units of measure.

Wrap Up

Did the students have an accurate idea of the size relationship between Earth and the Moon before doing this activity?

Did the effect of separating the scale models help them visualize the distance to the Moon?

Extensions

1. How long did it take Apollo astronauts to travel to the Moon?
2. Have students measure the circumferences of various spheres so that each group uses a different pair of models.
3. Instead of using the average distance to the Moon, use the distance from July 20, 1969, to recall the Apollo 11 landing or use the distance for today.

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Exploring the Moon – A Teacher's Guide with Activities, NASA EG-1997-10-116-HQ

Distance to the Moon Activity

Student Page



Distance to the Moon

Purpose

To calculate the distance between scale models of Earth and the Moon.

Key Word

scale

Materials

"Moon ABCs Fact Sheet"

sports balls

calculator

meter tape

Procedure

1. If Earth were the size of an official basketball, then the Moon would be the size of: another basketball? soccer ball? baseball? tennis ball? golf ball? marble?

2. The diameter of Earth in kilometers is:

3. The diameter of the Moon in kilometers is:

4. What percentage of Earth's diameter is the Moon's diameter?

5. Use the list below to change or confirm your answer to Question 1.

	diameter in cm
official basketball	24
size 5 soccer ball	22
official baseball	7.3
tennis ball	6.9
golf ball	4.3
marble	0.6

If Earth is a basketball, then the Moon is a:

Distance to the Moon

6. Use an official basketball as a model of Earth. Use a second ball, the one you determined from Question 5, as a model of the Moon.

7. Determine the scale of your model system by setting the diameter of the basketball equal to the diameter of Earth.

_____ cm = _____ km therefore,

1 cm = km

8. If the distance to the Moon from Earth is 382,500 km, then how far apart must you separate the two scale models to accurately depict the Earth/Moon system?

Using the scale value in the box from Step 7, the model separation in centimeters (x) is derived:

$$x = \frac{\text{actual distance to the Moon in kilometers}}{\text{scale value in kilometers}}$$

$$x = \frac{\text{382,500 km}}{\text{1 cm}}$$

x = _____ centimeters

The two scale models must be separated by _____ meters.

9. Set up your scale model of the Earth/Moon system. Does it fit in your classroom?

